SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, AUGUST 12, 1904.

CONTENTS:

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

INAUGURAL ADDRESS OF PRESIDENT CHARLES RICHARD VAN HISE.

"And ye shall hallow the fiftieth year. . . . A jubilee shall that fiftieth year be unto you."—*Leviticus*, XXV: 10 and 11.

UPON behalf of the regents and faculty I thank the hundreds who have come here to join in the jubilee of the University of Wisconsin. We are delighted to welcome our guests from all parts of the United States, from Canada, from Europe, and from other parts of the world. Among the honored guests are official representatives of universities, academies and learned societies, of museums and libraries, bearing the congratulations of the institutions which they represent. That the chief learned institutions of the United States, a considerable number of foreign institutions, and many renowned scholars should regard this jubilee as of such consequence as to wish to take part in it, should encourage the state to continue to support and further to develop its university.

Fifty years ago the instructional force of the very small college here situated, even then called the University of Wisconsin, consisted of four members—three professors and one tutor. That year there were in attendance 56 students, all men, of whom only 41 were of collegiate grade. At that time the only building on the ground was old North Hall. This building still stands to give evidence of the architectural taste of those who designed it. Even in these early days Chancellor Lathrop and other men who controlled the policy of the university had visions of the

future. A wide avenue was laid out from the head of State Street to the crest of University Hill. Upon one side of the avenue, somewhat down the slope, was placed North Hall, it being planned to build a South Hall at the corresponding place upon the other side, and to locate the main building of the future university upon the crest of the hill. The dreams of the men of this time went even further than this, their plans providing for four dormitories. Later structures, and all succeeding plans, have left free the broad avenue above State Street, and the three buildings—North, South and University Halls—stand at the places assigned them by the men who, in their minds, created these structures before the foundation of any was laid.

At the end of the college year of a half century ago two students were graduated, Charles T. Wakeley and Levi Booth. We hoped the latter would sit upon the platform to-day as a guest of the university, but in the midst of his preparations for the long journey from Denver he was stricken with a serious disease. We deeply sympathize with him in his misfortune and hope for his speedy recovery. Upright and influential in the community in which he lives, a leader in his chosen vocation, we recognize him as a type of the thousands who since 1854 have been granted the degree of this university.

The morning is too far advanced to permit a narrative of the development of the University of Wisconsin from the time it bestowed its first blessing upon Charles T. Wakeley and Levi Booth. Many of us have read of, and some of those here knew of the struggle first for existence and, later, for advancement, during the twenty years from 1854 to 1874.

At the beginning of this period Chancellor Lathrop was still president; then followed the two years' incumbency of Chancellor Barnard; the headship of Professor Sterling for six years; the presidency of Paul Chadbourne for four years; and the four years' term of President Twombly. During these years great progress was made, with exceeding slowness and difficulty at first, haltingly always, but still progress. South Hall and University Hall, planned by the adventurous thoughts of the leaders of the early days, were built. Slowly recognizing that in a state university there must be no distinction between the sexes, the authorities of the university constructed Chadbourne Hall and gradually admitted women to all the privileges of the university. Substantially the same relations which now obtain between the high schools and the university were established, the certificates of high schools being accepted by the university, thus linking together in one unbroken chain the various branches of state education. The departments of law, agriculture and engineering were started. Finally, in 1872, the state, confessing that it had frittered away the university land-grants in order to attract settlers to Wisconsin, recognized its obligation, and gave to the university financial support to the extent of $10,000 per annum. This sum was small, but it was of profound significance as marking a fundamental obligation of the state, the ignoring of which would have delayed for many years the growth of the university, if it would not have indefinitely condemned the institution to obscurity. At the end of this period of twenty years the faculty consisted of 29 members; the students, exclusive of the preparatory class, numbered 310.

While the dawn of prosperity may be said to have appeared between 1870 and 1874, this latter year marked a new epoch in the university, for then came John Bascom, of Williamstown, Mass., as our presi-

dent. His administration continued for thirteen years, from 1874 to 1887. Preparatory work was now cut off, and transferred to the high schools. The College of Letters and Science, in these earlier years called the College of Arts and Letters, became consolidated and unified. Strong courses in the liberal arts were built up. While instruction in law and the applied sciences of agriculture and engineering increased somewhat, these subjects were still of very subordinate importance. During the administration of Dr. Bascom the instructional force increased from 29 to 49, the college students from 310 to 505. At the beginning of this administration there was one so-called resident graduate and at the end there were three. These advanced students mark the dawn of graduate work. During President Bascom's administration Assembly Hall and the first Science Hall were built. A few years later the latter was destroyed by fire; but so rapid had been the development of science in the university, that it was necessary to replace this building by a larger and better Science Hall and to provide separate buildings for chemistry and shop work.

Of deep significance with reference to the future was the fact that during these years ex-Governor C. C. Washburn, a man who had gained his fortune in the Northwest, gave a portion of this wealth to the university in the form of Washburn Astronomical Observatory. For more than twenty-five years this institution has been of inestimable advantage to students of science, and one of the important centers of productive scholarship at the university. It has thus helped to make the university known, not only in the state, but throughout the nation and the world. But, perhaps, most promising of all with reference to the future, was the action, in 1876, of the state legislature, which levied a continuing one tenth of a mill tax for the support of the university. In 1883 this tax was increased to one eighth of a mill and in later years the state grants have been further increased from time to time. Thus the state became committed to permanent and liberal financial support of the university.

While the alumni of the time of John Bascom remember with delight their student days, while they retain much that they then acquired, while they place above price the intellectual attainments which have enabled them successfully to deal with the world, probably for many of them the most treasured remembrance, the most potent influence which they carried away from the university, was the pervasive, mastering, moral power of John Bascom, whose personality wrought itself during his presidency into every graduate. The men of the days of Dr. Bascom may, or may not, now believe the tenets of his formal philosophy and ethics as given in his books, and as pounded into them in the class-room with sledge-hammer blows, but they believe and share in his high ideals, are inspired by his burning enthusiasm, and have thus been led to stand steadily for the right.

Following the administration of Bascom came that of President Chamberlin, from 1887 to 1892. During these years the new Science Hall was completed, the Law Building was constructed, and an appropriation was secured for a gymnasium. The instructional force increased from 50 to 68; the students from 505 to 1,092. The graduate students increased from 3 to 22. The work in law, agriculture, and engineering, which had been mere adjuncts to the study of liberal arts, received organization as colleges. This perfected the present organization of the university into Colleges of Letters and Science, of Engineering, of Agriculture and of Law.

A distinctive feature of Chamberlin's administration was the recognition of the importance of applied science. The profound necessity for raising the ancient art of agriculture to a science, in order that the land shall yield its fullest return, and that the occupation shall be dignified and ennobled, was fully appreciated. It was also seen that in this age, in which the world is for the first time being taken possession of by man, advance is largely in the hands of the engineer.

But, perhaps, of even greater significance than the development of applied science was the emphasis placed by Chamberlin upon scholarship and research—a definite attempt on his part to make the institution of which he was the head justify the name of university. To this end the system of university fellowships was established, scholars and investigators were added to the faculty, and the small beginnings of what, during the present year, became a graduate school appeared. The profound influence of this movement was not limited to the advancement of knowledge. It was equally important in the diffusion of knowledge. The man who is so full of enthusiasm for his chosen subject that he will burn his brains for its advancement is an inspiring teacher. He is the man who illuminates the knowledge of a thousand years ago with the discovery of to-day.

Following Chamberlin's administration came that of Adams from 1892 to 1901. On account of the ill-health of Dr. Adams, for the last two years of his administration, the charge of affairs was largely in the hands of Dr. Birge, and, after Dr. Adams's resignation in 1902, Dr. Birge was acting president until 1904. During these twelve years the gymnasium was finished, the large group of agricultural buildings, including Hiram Smith Hall, the Horticulture-Physics building and Agricultural Hall, were constructed. And, crowning all, by the joint efforts of the Historical Society and the university, the superb state library building arose, little short of the perfection of the structures of the ancient models. This building stands as a permanent and powerful influence for the promotion of the beautiful and appropriate in architecture.

During the twelve years' administration of Drs. Adams and Birge the instructional force increased from 68 to 180, the number of students from 1,092 to 2,877, and the graduate students from 22 to 115.

The applied sciences of engineering and agriculture rapidly developed during those years toward their true proportionate position in the university. The course in commerce, which may be called a course in applied arts, was organized. This course was at once a conspicuous success.

The rapid rise of applied education in the university during the administrations of Chamberlin and Adams alarmed some persons, who feared that the influence of the liberal arts was thereby endangered. As a matter of fact, during Chamberlin's administration the number of regular undergraduates in the College of Letters and Science increased from 217 to 711, and during the following twelve years to 1903, excluding those in commerce and pharmacy, from 711 to 1,232. During these same seventeen years the number of graduate students increased from 3 to 119.

In education, as in industry, when a fortunate development takes place which meets a need, it finds students adapted to it. Were it not for the courses of applied education in the university, it is safe to say that about 1,000 students now here would be somewhere else, and it is also certain that if technical education had nowhere developed in this country, a large proportion of this 1,000 students would never have entered a university. If one but compares the very slow increase in

the number of students at Oxford, where the old curriculum has remained largely intact, with the rapid increase in the number of university students where applied education has developed, he will not doubt the correctness of these statements. Applied education is mainly fed by a new constituency. While applied education may attract a few students, who otherwise would have gone into the courses of liberal arts, the tremendously increased momentum of the educational movement produced by the large numbers that flock to the universities probably has brought to the liberal arts more students than have been lost to it by the rise of applied knowledge.

While all this is true, it is fortunate that in this university the College of Letters and Science became so firmly established before agriculture and engineering were developed. So strong are the liberal arts and pure science, that I have no fear that the College of Letters and Science will lose its leading position in the university. For this college the union of the great Historical Library, the University Library and the Wisconsin Academy Library is most fortunate. This superb joint library is doing for the liberal arts what the various science buildings with their equipment have done for the pure and applied sciences, affording opportunity for the highest grade of work, an opportunity utilized by the students in those departments in which men of university caliber occupy the chairs. As evidence of the increasing power of the College of Liberal Arts is the recent growth of graduate work, the students in which, with few exceptions, are in the College of Letters and Science.

During the current year the schools of economics and political science, of history, of pharmacy, of education and of commerce, which had been organized under the administrations of Chamberlin and Adams, have been merged in the College of Letters and Science. These changes place all of the economic work done in the university in the Department of Political Economy; all of the botanical and chemical work heretofore done in the School of Pharmacy under the Departments of Botany and Chemistry, respectively. The purpose of the change is to correlate the work in these various lines with the work in the liberal arts, thus unifying the College of Letters and Science without weakening its various courses in any way. The courses in commerce and in pharmacy now have the same relation to the other courses of the College of Letters and Science, that the courses in civil engineering and electrical engineering have to the course in general engineering. The graduate work of the university, being located in all of the colleges and representing their culmination, has been organized into a school.

The catalogue of the present year shows an attendance of 3,150 students, and an instructional force of 228, while this commencement there will be conferred in course 361 degrees, of which 334 are bachelors, 17 masters and 10 doctors. If we contrast these numbers with those of fifty years ago, an instructional force of 4, 56 students and 2 baccalaureate graduates, is it surprising that we should cry: 'and ye shall hallow the fiftieth year. . . . A jubilee shall that fiftieth year be unto you'? And with our joyfulness there is a profound feeling of thankfulness to the state that has had the wisdom to be guided by men of such breadth of view as to provide liberally for the education of its children and of all others who care to share its educational hospitality.

While the achievements of the past fifty years are sufficiently great for celebration, the ideal of the state university is still more worthy of celebration. A score of years ago it could not have been said of

any state in America, that it had shown willingness to support a university of the highest class; but now several state institutions are recognized as standing in the first group among American universities. These institutions are mainly supported through taxation imposed by a democracy upon itself, for the sons and daughters of the state, poor and rich alike. Until this movement of the state universities had developed, the advantages of all educational institutions of the highest rank in all countries had been restricted to one sex, and even now it is practically impossible for the sons of artisans and laborers to enter the doors of many. In state institutions, where education is maintained by the people for the good of the state, no restriction as to class or sex is possible. A state university can only permanently succeed where its doors are open to all of both sexes who possess sufficient intellectual endowment, where the financial terms are so easy that the industrious poor may find the way, and where the student sentiment is such that each stands upon an equal footing with all. This is the state university ideal, and this is a new thing in the world.

The older universities of America have developed from small colleges. The earlier colleges of the United States were modeled upon Oxford and Cambridge. We turn for a moment to these institutions, in order to understand the nature of their influence upon the American university. If one were to name the most fundamental characteristic of these English institutions, it would be the system of halls of residence, involving commons, unions and athletic fields. The communal life of instructors and students in work, in play and in social relations is the very essence of the spirit of Oxford and Cambridge. It might almost be said that this constitutes Oxford and Cambridge. So fundamental have the English regarded the system that, from time to time, when the students have become too numerous for accommodation in existing quadrangles, another college has been founded upon the pattern of the others. If one were to consider the modern demands upon a university and especially the demands for wide opportunity to study science, pure and applied, he could scarcely imagine a more antiquated system than that represented at Oxford and Cambridge. Indeed, the old system has failed to meet the new conditions, and Cambridge especially is being rapidly modified under them, the various colleges contributing jointly for laboratories in pure and applied science, which may be utilized by the students of all the colleges. But, in making these radical changes, there is no thought of abandoning the halls of residence, with their communal life. Rather than surrender these, the authorities would, I believe, give up all modern lines of work. The college system of Oxford and Cambridge may seem absurd, but for some reason these universities have produced an astonishingly large proportion of great statesmen, writers and scientists. The men of Oxford and Cambridge have been largely instrumental in extending the empire of Britain over the earth; they have contributed liberally to the greatest literature of the world; they have furnished many fundamental ideas to science. In view of these stupendous results we need scarcely wonder that the Englishman is not eager to make over Oxford and Cambridge after the Yankee or the German model.

In the early days of the University of Wisconsin, when the only college buildings were North and South Halls, when Professor Sterling, his family, several instructors and a majority of the students lived in these halls, we had the essentials of the English system. Even when President Bascom came here in 1874 the remnants of the system still existed. Many of the men,

a majority of the women and a number of the instructors lived in the dormitories. In 1884 came the disastrous fire which destroyed the first Science Hall. There was urgent necessity for lecture rooms and laboratories to carry on the instructional work of the institution. Without any definite plan to change our system, indeed without any thought of the profound change which was being made in the character of the university, the students were turned from the dormitories, and halls of residence for men at Wisconsin were abandoned.

I have no doubt that every one of the alumni here, who in the old days lived in North or South Hall, feels that this change, although possibly necessary at the time, was most unfortunate. The professor in the class-room and the laboratory can do much for a student, and especially he can do much if he believes that one of the highest functions of a professor is that of a comrade. But, when the student goes out into the world, there is no other part of his education which is of such fundamental importance as capacity to deal with men, to see the other fellow's point of view, to have sympathetic appreciation with all that may be good in that point of view, and yet to retain firmly his own ideas and to adjust the two in fair proportion. Nothing that the professor or the laboratory can do for the student can take the place of daily close companionship with hundreds of his fellows. In the intimate communal life of the dormitories he *must* adjust himself to others. He must be genial, fair, likable, or else his lot is rightly a hard one. This fundamental training in adaptability to and appreciation of his fellows can only come from attrition between a large number of human units. These are the reasons, understood without statement by Englishmen, which make them adhere to the Oxford and Cambridge system. These are the reasons, profoundly comprehended by Cecil Rhodes, which led him to leave his entire fortune to establish the Rhodes scholarships at Oxford for the Teutonic race, knowing as he did from experience the influence of the communal life of Oxford in molding a world-conquering man. Believing, as he did, that the Teutonic people are to control the destinies of the world, he was deeply anxious that many of the best of the youth of Africa, Australia, Canada, Germany and America should gain the Oxford point of view.

Harvard, Yale, Princeton and Pennsylvania, originally modeled on the English university, and suffering under no accidental disturbance, have retained many of the features of this system to the present day. If the University of Wisconsin is to do for the sons of the state what Oxford and Cambridge are doing for the sons of England, if it is to do even what the eastern institutions are accomplishing for their students, not only in producing scholars and investigators, but in making men, it must once more have halls of residence, and to these must be added a commons and a union. At the commons the men meet one another each day; at the union they adjourn for close, wholesome, social intercourse. The union should be a commodious and beautiful building, comfortably, even artistically, furnished. When the students are done with their work in the evening, the attractive union is at hand, where refreshments may be had, and a pleasant hour may be spent at games, with the magazines, in a novel, or in social chat. The coarse attractions of the town have little power in comparison.

But, to build adequate halls of residence, commons and a union will require large sums of money. What more fitting thing for wealthy men of the state, who have gained their riches by taking advantage of its natural resources, than to turn back to the state some portion of their wealth for

this most pressing need? In no way can a man leave a more appropriate and permanent monument for himself than by building a hall of residence, a commons or a union. The state of Wisconsin is a safer trustee than any individual or corporation. The man who attaches his name to a hall, a commons or a union will fix that name as one to be loved in the minds of the unnumbered sons of the state that during the centuries to come will flock to the University of Wisconsin to obtain intellectual training, to develop high ideals, and more than all, to gain sterling, vigorous, self-sufficient, adjustable manhood. May I not hope that before the end of this jubilee year the money will be forthcoming to provide for these needs, so that the necessarily very large demands upon the state may be restricted to supplying additional buildings, equipment and instructional force made imperative by the extraordinary increase in number of students at the university?

We have now very briefly sketched the effect of *one* of the influences of the English upon the American university, but there remain other influences to be considered. The original American college was essentially a counterpart of the English college; indeed, this was true well into the nineteenth century. But, in the second half of that century, important American modifications appeared to better adapt the college to our needs. Perhaps the most important of these was the development of pure science and its assimilation by the college of liberal arts. This radical change met a much more ready welcome in the west than in the east. For a long time in the east science was regarded as an intruder, and was only slowly and partially admitted to full fellowship with the studies of the old curriculum. When science was finally, grudgingly, given a place in some of the more important institutions, it was made an appendix to the college, and in a number of cases a new name was attached. This is illustrated by the Lawrence and Sheffield Scientific Schools. In the west science did not receive separate foundations, although the courses in which science was the major line of work were at first kept separate from the old course in which the classics and mathematics dominated. A new degree was given for science, which, for many years at least, was regarded as inferior to the A. B. degree. To the present time in some institutions of the east the distinction between work in science and work in the old curriculum is retained; and in one the organization of the college and the scientific school are so nearly independent that the college has introduced science into its courses, thus duplicating much of the work of the school. And in another, where the separate organization of the classical college and the scientific school is more or less formal, different degrees are granted in the college and in the school, without regard to whether the subjects pursued by the students receiving the different degrees are the same or not. In the state universities where the college and school of science were never made separate foundations, and where with the great increase in number of subjects, freedom of election has been introduced, it has become recognized either that there should be a separate degree for every group of studies, or else one degree for any group of liberal studies. This latter alternative has been accepted by the leading state universities, and, in this respect, it is believed that they are leaders in educational progress, although not pioneers, for Johns Hopkins led the way. No one now doubts the right of pure science to full admission to the list of subjects which may be pursued for a liberal education. Not only so, but it is recognized that the scientific spirit has permeated and vivified the studies of the old college course.

Scarcely less noteworthy than the winning of a place for pure science in the university has been the rise of the great groups of studies classified under political economy, political science, sociology and history. From a very subordinate, almost insignificant, place in the curriculum, they have risen to a place not subordinate to classics or science.

The development of these subjects in the universities is destined to have a profound influence upon governmental progress. In the university men are trained to regard economic and social questions as problems to be investigated by the inductive method, and in their solutions to aim at what is best for the whole people rather than at what is favorable to the interests with which they chance to be connected. Such of these men as are filled with a burning enthusiasm for the advancement of the race, are capable of great accomplishment, for they possess the enlightenment upon which wise action may be based. Already men who have studied history, economics, political science and sociology in the universities have achieved large results in the formulation and enforcement of the written law, and in the growth of a healthy and powerful public sentiment. Soon such men will be found in every city and hamlet, leading the fight against corruption and misrule; but, even more important and vastly more difficult, leading in constructive advance. In these men lies, in large measure, the hope of a peaceful solution of the great questions deeply concerning the nation, some of which are scarcely less momentous than was that of slavery.

But the western people were not content with the expansion of pure knowledge. They demanded schools of applied knowledge. This demand was early recognized in this and many other universities by the organization of law schools, which deal with subjects closely concerning each individual. So important is the subject of the law that these schools of applied knowledge were very early established and their subsequent development has been uninterrupted.

After science found its way into the universities, a natural, indeed an inevitable outcome of its admission into the institutions supported by the states demanding both culture and efficiency was the rapid growth of the applied sciences, of which the more important are agriculture, engineering and medicine. But the people of the west went even further than this and demanded that language, mathematics, political economy and history should be so taught as to serve the man of affairs, and thus there arose here the first strong course in commerce in the United States. Such a course has now been introduced into a number of other institutions, including one of the principal universities of the east. Whether one deplores or approves the rise of applied knowledge in the universities, it is an inevitable movement which, for my part, I expect to see extended. In the recognition of the intellectual power gained by pursuit of applied knowledge and its extreme importance in the development of the nation, the state universities of the west have been at least abreast of the eastern institutions.

From the foregoing it is plain that the most important American modifications of the English college system have been the introduction and development of pure science and applied knowledge. While these modifications represented a great broadening of the classical college, they did not produce a proportional increase in the height of the edifice of knowledge.

This leads us to another influence upon the American university, which has profoundly modified it—the German influence. Some thirty years ago Johns Hopkins, at Baltimore, left his fortune to found a university, and Daniel C. Gilman was called

as its first president. President Gilman saw an opportunity for a new type of institution in America. Having visited universities abroad, he became convinced that the great need was for a university upon the German model, where investigation and the production of scholars should be the dominating ideas. The ablest scholars at home and abroad were invited to fill the chairs of Hopkins. The success of this new type of institution in America was almost instantaneous. Not only did Hopkins soon become a chief center of research in this country, but it sent scores of men with Hopkins training as professors to other universities. Even earlier than the foundation of Hopkins, a steady stream of students was returning to America from German universities, bringing with them the German spirit. After the foundation of Hopkins this stream increased rapidly in size. The students trained at Hopkins and in Germany could not fail to influence the more important institutions of the country. There slowly appeared upon the stronger of the old colleges a superstructure.

This upward movement was more quickly felt in the east than in the west, but, even in the west, here and there, a scholar in the state universities appeared who was not content to do instructional work alone. At Wisconsin the first of these were Allen and Irving. Chamberlin, an investigator, believing in research in state universities, when he became president at Wisconsin, began systematically to develop scholarship and research. Other state universities have gone through similar stages of growth. Thus both in the east and in the west the graduate school has arisen upon the college, and its influence permeates all parts of the university. But the growth of the graduate school in the American university has been slow. The cost of such a school, relative to the number of students within it, is large, and it has been assumed that the state universities especially must not go too far in the development of such a school. No mistake could be so fatal to the power for good of the state university. In Germany, where the universities mainly devote themselves to the class of work done in the graduate school, the universities are, without exception, supported by the government. The German statesman regards it as a matter of course—as settled beyond dispute—that the production of scholars and investigators at the university is a necessity to the nation. To them, he believes, is largely due the great position which Germany has taken during the last half century. It was after the disasters of the Napoleonic wars that the German educational system was reconstructed, at the top of which was the university. The rise of the university has been correlative with, and one of the chief causes for, the rise of Germany.

If time permitted, I should be glad to consider the effect of university work upon the mind of the student, that is, work in which he takes a share as an investigator and during which he acquires the spirit of research. It would be easy to show that the qualities of mind gained by such work are those which best fit him for the struggle of life—which best fit him to handle difficult business, social and economic problems. In Germany the university scholar is a man of affairs. He is found in all important divisions of administration. Almost every prominent German and Austrian professor is an official adviser to the government. Already, in America, we see the beginning of this movement. University professors are asked to serve on tax commissions, in the valuation of railroads and in various other capacities. Within the next half century the number of such men in these and similar positions will increase many fold. The college-trained man,

and especially the university-trained man, is, directly or indirectly, to control the destinies of the nation.

But while the professor performs important service outside the university, his greatest service is his own creative work and the production of new scholars in the laboratory and seminary. I unhesitatingly assert that there is no investigation of matter or force or mind to-day in progress, but to-morrow may become of inestimable practical value. This could be illustrated by various investigations which have been made here. It is easy to show that the discoveries at the University of Wisconsin bring vastly more wealth to the state each year than the entire expenditure of the institution, but to tell of them might seem like placing too great emphasis upon our own achievements, and I, therefore, turn elsewhere for illustrations.

Scarcely more than a century since, Franklin began studies upon the nature of lightning. Later the character of electrical force was during many years investigated with remarkable power by Faraday. If, during these studies, some one had said: 'Of what practical value can be the discoveries of Franklin and Faraday?' no one could have given the answer. Had this work been paid for by the state it would have been easy to show to the legislature that such a foolish waste of money was wholly unwarranted. But out of the discoveries of Franklin and Faraday, and those who followed them, has come one of the greatest material advances that the world has known. Electricity has become the most docile of the forms of energy. It serves to carry to distant points the power of Niagara. It is the nerves which make all the world one body, which bring to us instantaneously all the happenings in every quarter of the globe, which puts in our ear the vibrations of the voice of our friend a thousand miles away. Through increased knowledge of nature the peoples of all nations are being made slowly, haltingly, with occasional disastrous wars, into one family. And this is largely the result of recondite studies upon subtle forces, which, even now, we can not define, but which we can utilize.

A striking case of the profound service of the investigator is furnished by the studies of Pasteur and Koch. If, a half century since, a legislator in France had wished to be humorous at the expense of the scientist, what better object of derision could he have found than his countryman, Pasteur, who was looking through a microscope at the minute forms of life, studying the nature and transformations of yeast and microbes? And yet, from the studies of Pasteur and Koch, and their successors, have sprung the most beneficent discoveries which it has been the lot of man to bestow upon his fellow men. The plague and cholera and yellow fever are controlled; the word diphtheria no longer whitens the cheek of the parent; even tuberculosis is less dreaded and may soon be conquered; aseptic surgery performs marvelous operations which, a few years ago, would have been pronounced impossible. The human suffering thus alleviated is immeasurable.

These illustrations are sufficient to show that no knowledge of substance or force or life is so remote or minute, although apparently indefinitely distant from present practise, but that to-morrow it may become an indispensable need. The practical man of all practical men is he who, with his face toward truth, follows wherever it may lead, with no thought but to get a deeper insight into the order of the universe in which he lives. It can not be predicted at what distant nook of knowledge, apparently remote from any practical service, a brilliantly useful stream may spring. It is certain that every fundamental discovery yet made by the delving student has

been of service to man before a decade has passed.

Already at Wisconsin here and there a scholar has arisen whose most elemental thought is to see deeper into the order of nature. Let the university search well for such spirits and give them unbounded opportunity, for they are to be benefactors, not only of the state, but of the entire earth; for a new truth, a new principle, is not the property of any state, but instantly belongs to the world. May men of creative power, trained by Wisconsin, leave our doors in ever-increasing numbers, until they become a great enlightening influence in the state and the nation! The final and supreme test of the height to which a university attains is its output of creative men, not in science alone, but in arts, in literature, in ethics, in politics and in religion.

I, therefore, hold that the state university, a university which is to serve the state, must see to it that scholarship and research of all kinds, whether or not a possible practical value can be pointed out, must be sustained. A privately endowed institution may select some part of knowledge and confine itself to it, but not so a state university. A university supported by the state for all its people, for all its sons and daughters, with their tastes and aptitudes as varied as mankind, can place no bounds upon the lines of its endeavor, else the state is the irreparable loser.

Be the choice of the sons and daughters of the state, language, literature, history, political economy, pure science, agriculture, engineering, architecture, sculpture, painting or music, they should find at the state university ample opportunity for the pursuit of the chosen subject, even until they become creators in it. Nothing short of such opportunity is just, for each has an equal right to find at the state university the advanced intellectual life adapted to his need. Any narrower view is indefensible. The university should extend its scope until the field is covered from agriculture to the fine arts.

The barrenness of America in the creation and appreciation of literature, music and art is the point upon which Europe charges us with semi-barbarism. If the university does not become the center for the cultivation of the highest capacities of the human mind, where is the work to be done in this country? In America there is no other available agency. This work must be undertaken by the university, or else remain undone.

If the people of the United States are to cease being mere money getters, if they are to accomplish more than material advance, if they are to have proportional development, the university must give opportunity for training in all lines of human endeavor.

If the University of Wisconsin is to do for the state what it has a right to expect, it must develop, expand, strengthen creative work at whatever cost. Only by so doing is it possible for the university to serve the state in the highest way. For my part, I look forward with absolute confidence to the liberal support by the state of a school whose chief function is to add to the sum of human achievement. I am not willing to admit that a state university under a democracy shall be of lower grade than a state university under a monarchy. I believe that legislatures elected by all the people are as far-sighted as legislatures that represent an aristocracy. A great graduate school will be realized at some state university during this century. Is Wisconsin to have this preeminent position?

We are now able to suggest the ideal American university—one which has the best features of the English system with its dormitories, commons and union; one which includes the liberal and fine arts and the additions of science and applied science; and one which superimposes

upon these an advanced school modeled upon the German universities, but with a broader scope. In such a university the student in the colleges of liberal and fine arts has opportunity to elect work in applied science, and thus broaden his education. He feels the inspiring influence of scholarship and research, and thus gains enthusiasm for the elementary work because it leads to the heights. The student in applied knowledge is not restricted to subjects which concern his future profession, but he has the opportunity to pursue the humanities and the fine arts, and thus liberalize his education. He, too, feels the stimulus of the graduate school, and, if one of the elect, may become an investigator and thus further ameliorate the lot of mankind by new applications of science to life. The student in the graduate school, primarily concerned with creative scholarship, may supplement a deficient basal training by work in the liberal arts and in the schools of applied knowledge. Thus the college of liberal arts, of applied knowledge and of creative scholarship interlock. Each is stronger and can do the work peculiar to itself better than if alone. This combination university is the American university of the future, and this the University of Wisconsin must become if it is to be the peer of the great universities of the nation.

Wisconsin is among the state universities which have this opportunity open to them. Many of the states have divided their grants among several foundations, supporting at different localities, schools of liberal arts, of agriculture, of medicine and of mining. In Wisconsin there is only one institution which attempts to do university work. Public and private funds alike, which are to go to a university, should come to that institution. This statement does not imply lack of appreciation of the excellent and very important work done by the colleges of the state. May they continue to thrive; may they continue to have the support of the citizens of the state; for the many thousands of students that during the next half century are continuously to demand a college education in this state can not be accommodated in one institution. Collegiate work should be done at several centers within the state, but professional and university work is so expensive and the different schools and colleges so closely interlock, that the best opportunities can only be furnished in the various fields in the university. At a university of the first rank the opportunities for instruction in the fields strongly covered are superior to those which can be offered in an institution devoted to a single field. Wisconsin has fortunately escaped the fatal mistake of subdivision of its university effort. With the concentrated support of the state, public and private, there is no reason why the University of Wisconsin should not do in every line as high grade work as any in the country. My faith is such that I look forward with confidence to the future, with profound conviction that the breadth of vision, which has enabled this institution to grow from small beginnings to its present magnitude, will continue to guide the state, until a university is built as broad as human endeavor, as high as human aspiration.

THE UNIVERSITY OF MONTANA BIOLOGICAL STATION AND ITS WORK.

THE University of Montana Biological Station at Bigfork, on Flathead Lake, opened its sixth annual session on July 18, the session lasting for five weeks. The circular giving announcement of the work for the season contains a number of new and choice original photographs, giving views of the region in which the station is located, including sketches of Flathead